

Claims

1. Sensor system for determining the glucose concentration in blood, comprising an implantable sensor (1, 1') and a user device (B) associated with the latter,
 5 characterized in that the sensor (1, 1') is in the form of an ampoule which contains a sensitive liquid and into which glucose can penetrate, in that the viscosity of the mixture consisting of the sensitive liquid and the glucose is measured, and in that the user device (B) consists of a portable device worn externally on the skin, the measurement and its evaluation being controlled through the user device (B).
- 10 2. Sensor system according to Claim 1, characterized in that the viscosity is measured on the basis of the oscillatory behaviour of an oscillating element (8) which is disposed in the sensor (1) and can be excited to oscillate by an oscillating magnetic field.
3. Sensor system according to Claim 2, characterized in that the oscillatory
 15 behaviour of the oscillating element (8) is analysed on the basis of its decay behaviour following switch-off of the magnet (6), the oscillating element (8) itself generating a magnetic field which is measured by the user device.
4. Sensor system according to either of Claims 2 or 3, characterized in that the oscillating element additionally homogenizes the liquid in the sensor (1).
- 20 5. Sensor system according to Claim 4, characterized in that the oscillating element (8) is positively joined to the magnet (6) and consists of a bending bar.
6. Sensor system according to Claim 5, characterized in that the magnet (6) is attached to one of the two ends of the bending bar and can be caused to oscillate by a magnetic field (13).
- 25 7. Sensor system according to Claim 6, characterized in that the said magnetic field (13) is generated by an electromagnetic arrangement provided in the user device (B) or by an electric coil provided in the sensor (1).
8. Sensor system according to any one of Claims 2 to 7, characterized in that the
 30 sensor (1) comprises a semipermeable wall (2) which permits penetration by glucose.
9. Sensor system according to any one of Claims 2 to 8, characterized by a plastic part (3), which is disposed in the sensor (1), partially filling the latter and thus

confining the liquid volume, and which is designed as a support for the oscillating element (8) and has an elongated bore (5) into which there projects an arm (11) which is disposed on the magnet (6) and which is provided for mixing the liquids together.

- 5 10. Sensor system according to Claim 7, characterized in that the said electromagnetic arrangement includes means for excitation of the magnet (6) in the sensor (1) and a magnetic-field sensor for the magnetic field generated by this magnet.
- 10 11. Sensor system according to Claim 10, characterized in that the said means and the said magnetic-field sensor consist of a magnet (12) and a coil (14) exciting the latter, and of a microprocessor (15) connected to the coil (14).
- 15 12. Sensor system according to Claim 1, characterized in that the viscosity is measured on the basis of the rotation of a measuring element (35) which is disposed in the sensor (1') and which can be driven by a driving magnet (24) likewise disposed in the sensor (1').
13. Sensor system according to Claim 12, characterized in that the rotation of the measuring element (35) is analysed on the basis of its decay behaviour following switch-off of the driving magnet (24).
- 20 14. Sensor system according to Claim 13, characterized in that the sensor (1') is of a two-stage construction, and has a head portion (20) and a measuring portion (21), the head portion (20) containing the driving magnet (24) and the measuring portion (21) containing the measuring element (35), and the driving magnet (24) being disposed in a casing (23), so as to be shielded against liquid.
- 25 15. Sensor system according to Claim 14, characterized in that provided between the head portion (20) and the measuring portion (21) is a reference portion (22), joining the latter two portions, which comprises a chamber (27) that is sealed against liquid and includes a rotatably mounted reference element (28) and the said sensitive liquid.
- 30 16. Sensor system according to either of Claims 14 or 15, characterized in that the head portion (20) and the measuring portion (21) are each of a cylindrical form, the diameter of the head portion (20) being greater than that of the measuring portion (21).

17. Sensor system according to Claims 15 and 16, characterized in that the reference portion (22) has the form of a truncated cone, and in that the reference element (28) and the measuring element (35) are designed as elongated cylinders.
- 5 18. Sensor system according to Claim 17, characterized in that the measuring portion (21) is designed as an elongated casing (34) which comprises window-type openings (36) and is lined on the inside with a semipermeable film (37) which permits penetration by glucose.
- 10 19. Sensor system according to Claim 18, characterized in that the driving magnet (24) can be caused to rotate by a magnetic field which is generated by an electromagnetic arrangement provided in the user device (B).
20. Sensor system according to Claim 19, characterized in that the measuring element (35) is driven via magnetic couplings (29, 31; 30, 38) between the driving magnet (24) and the reference element (28) and between the reference element (28) and the measuring element (35), respectively.
- 15 21. Sensor system according to Claim 20, characterized in that the magnetic coupling (30, 38) between the reference element (28) and the measuring element (35) is of such design that the measuring element (35) effects coupled rotation only to a certain critical rotational frequency.
- 20 22. Sensor system according to Claim 21, characterized in that, following switch-off of the drive of the driving magnet (24), the decay of its rotation is determined, above the critical rotational frequency, exclusively by the viscosity of the sensitive liquid in the chamber (27) of the reference portion (22) and, below the critical rotational frequency, by the viscosity of the mixture consisting of sensitive liquid and glucose in the casing (34) of the measuring portion (21).
- 25 23. Sensor system according to Claim 22, characterized in that a value of the glucose concentration, which is non-dependent on the temperature, is determined on the basis of the two viscosity values above and below the critical rotational frequency.